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LITHOLOGIC AND GEOPHYSICAL LOGS FOR EIGHT HOLES DRILLED DURING 1978
IN THE RATTLESNAKE BUTTE QUADRANGLE, ROUTT COUNTY, COLORADO

By

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This report has not been edited for
conformity with Geological Survey
editorial standards or stratigraphic
nomenclature.

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INTRODUCTION

A total of eight holes were drilled by the U.S. Geological Survey in Tps. 4 and 5 N., Rs. 86 and 87 W., in the Rattlesnake Butte quadrangle, Routt County, Colorado from August to October 1978 (figs. 1, 2, and 3). These holes are identified as RB-16, RB-17, RB-18, RB-19, RB-20, RB-22, RB-23, and RB-24 (table 1). RB-21 was located, but owing to limited time and equipment complications, was not drilled. The purpose of the drilling was to obtain information on the thickness, depth, continuity, and quality of the federally owned coals in the Upper Cretaceous Williams Fork Formation of the Yampa coal field.

The work was performed by U.S. Geological Survey personnel. The drilling was conducted using a drilling medium of air or air with water injection. Natural gamma and/or gamma-gamma density logs were run on each hole. When the water level was high enough, or when water was available to fill the hole, single-point resistance, self-potential, and/or neutron logs were run. On several occasions, a caliper log was also run. Cuttings for each hole were collected and described at 5-foot intervals.

Directly adjacent to holes RB-16, -23, and -24, a second hole was rotary drilled to just above the coal horizon, and a core was taken of the entire coal interval. Analyses of these cores are included in table 2.

The area is primarily underlain by the coal-bearing Upper Cretaceous Mesaverde Group although a few outcrops of the lowermost part of the Upper Cretaceous Lewis Shale Formation exist (fig. 4). Holes RB-17, -18, -19, -20, and -22 were located in order to penetrate the middle coal group of the Upper Cretaceous Williams Fork Formation. The holes were bottomed in the Trout Creek Sandstone Member of the Upper Cretaceous Iles Formation so as to use it as a marker bed for correlation purposes (fig. 5). The coal beds penetrated by these holes were the Wadge coal bed, approximately 235 feet above the Trout Creek Member, and the Wolf Creek coal bed, about 60 feet above the Trout Creek Member.

Holes RB-16, -23, and -24 were located in order to penetrate the upper coal group (fig. 6). The only minable bed encountered was the Fish Creek coal bed, which is approximately 260 feet above the Twentymile Sandstone Member of the Williams Fork Formation, a prominent marker bed between the upper and middle coal groups. One hole, RB-23, was drilled to the Twentymile Member, the other two only penetrated the Fish Creek coal bed.

Lithologic descriptions of the cuttings from each drill hole included in this report were logged by A. E. Stevenson and G. W. Stuckey. Where multiple lithologies were present, they are listed on the logs in decreasing abundance.

REFERENCE CITED

Ryer, T. A., 1977, Geology and coal resources of the Foidel Creek EMRIA site and surrounding area, Routt County, Colorado: U.S. Geological Survey Open-File Report 77-303, 31 p.

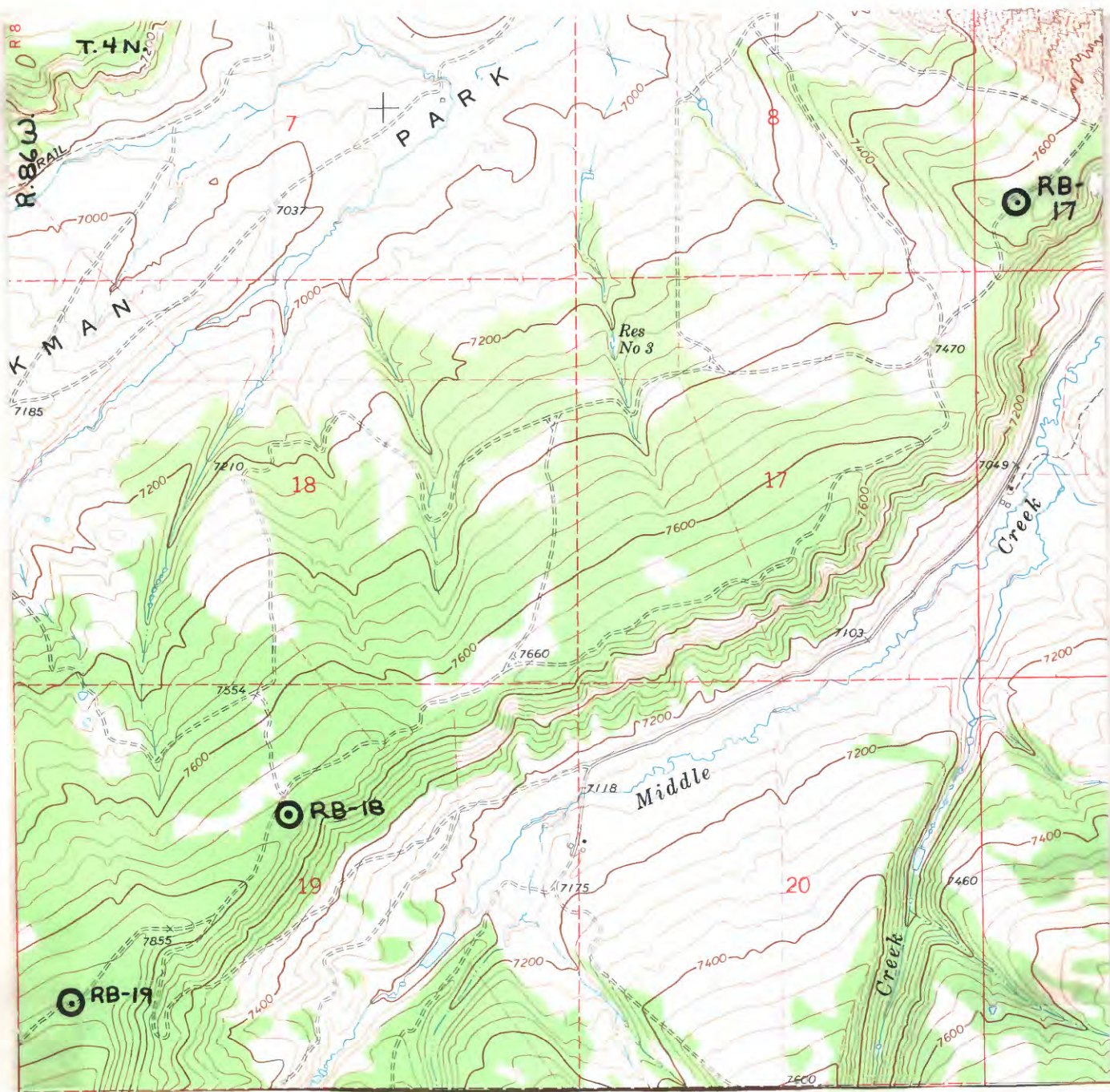


Figure 1.--Locations of drill holes in T. 4 N., R. 86 W., Eckman Park, Rattlesnake Butte quadrangle, Routt County, Colorado.

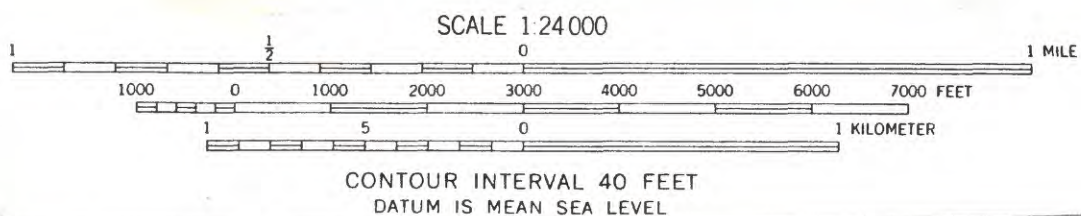
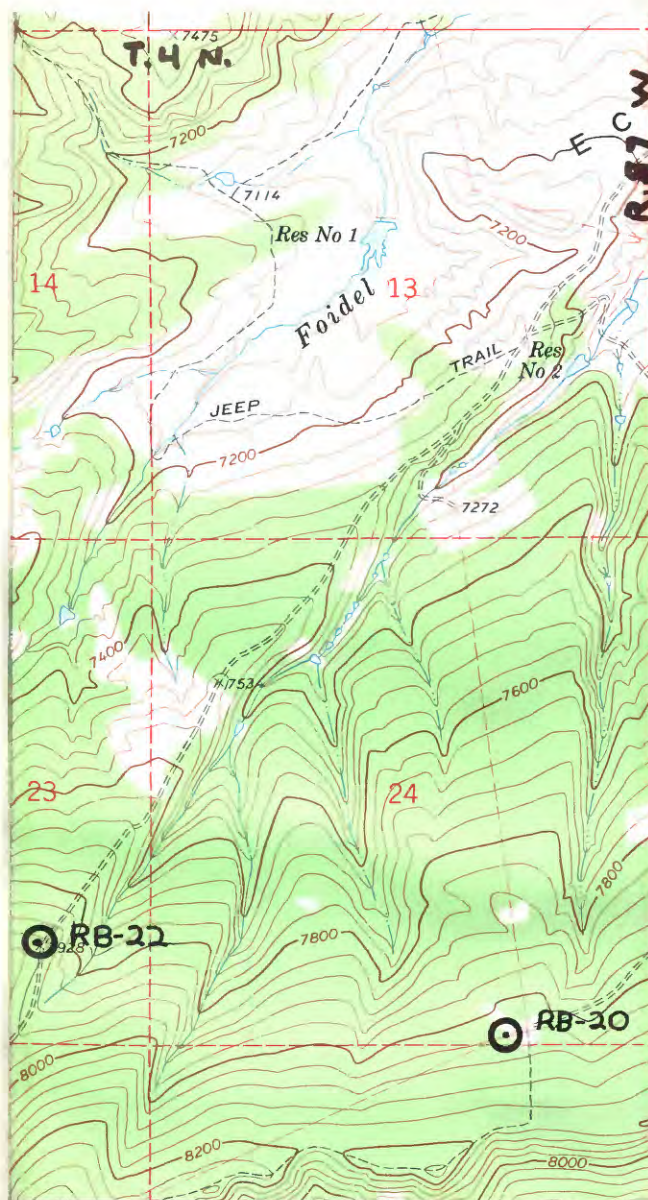


Figure 2.--Locations of drill holes in T. 4 N., R. 87 W., Eckman Park, Rattlesnake Butte quadrangle, Routt County, Colorado.

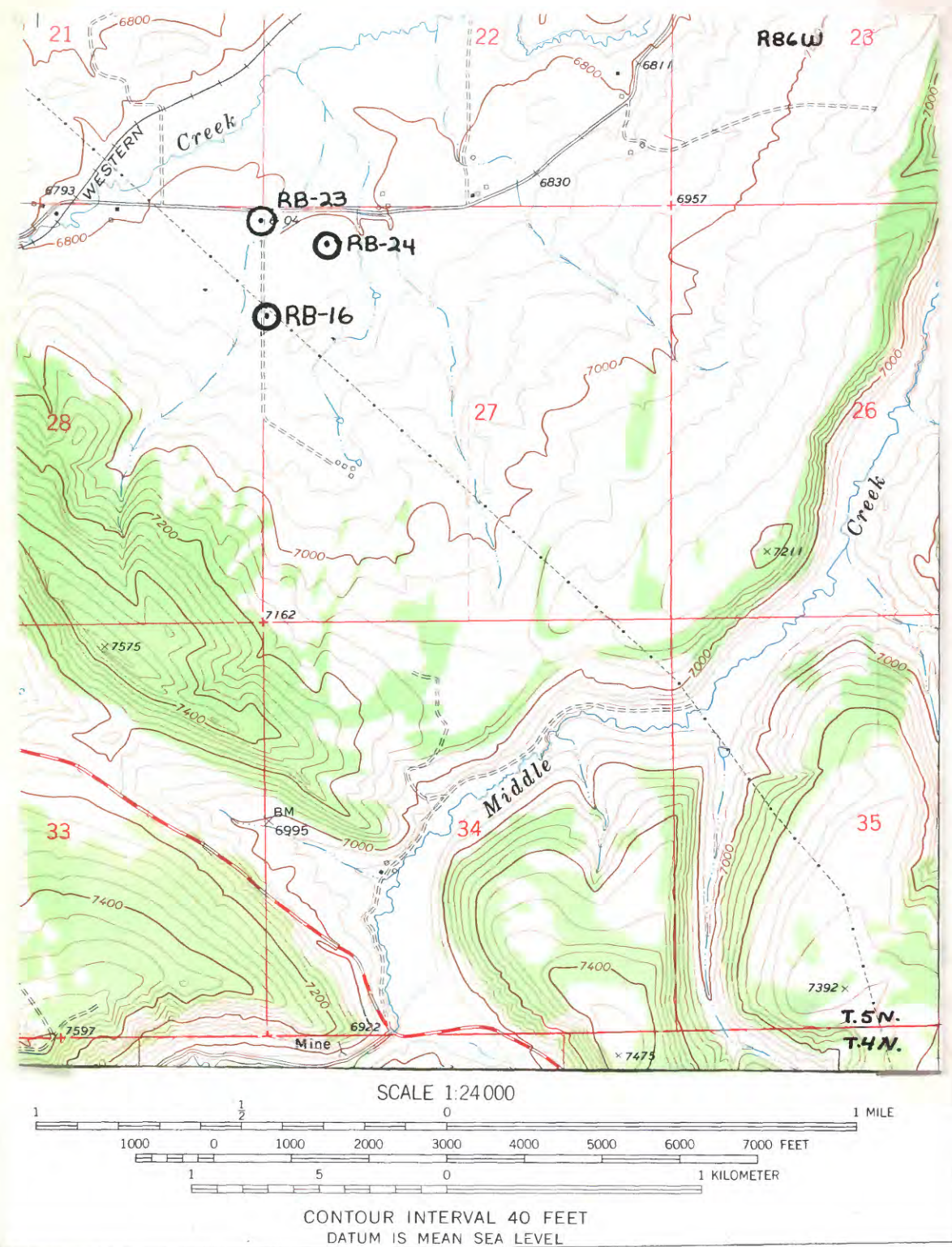


Figure 3.--Locations of drill holes in T. 5 N., R. 86 W., Rattlesnake Butte quadrangle, Routt County, Colorado.

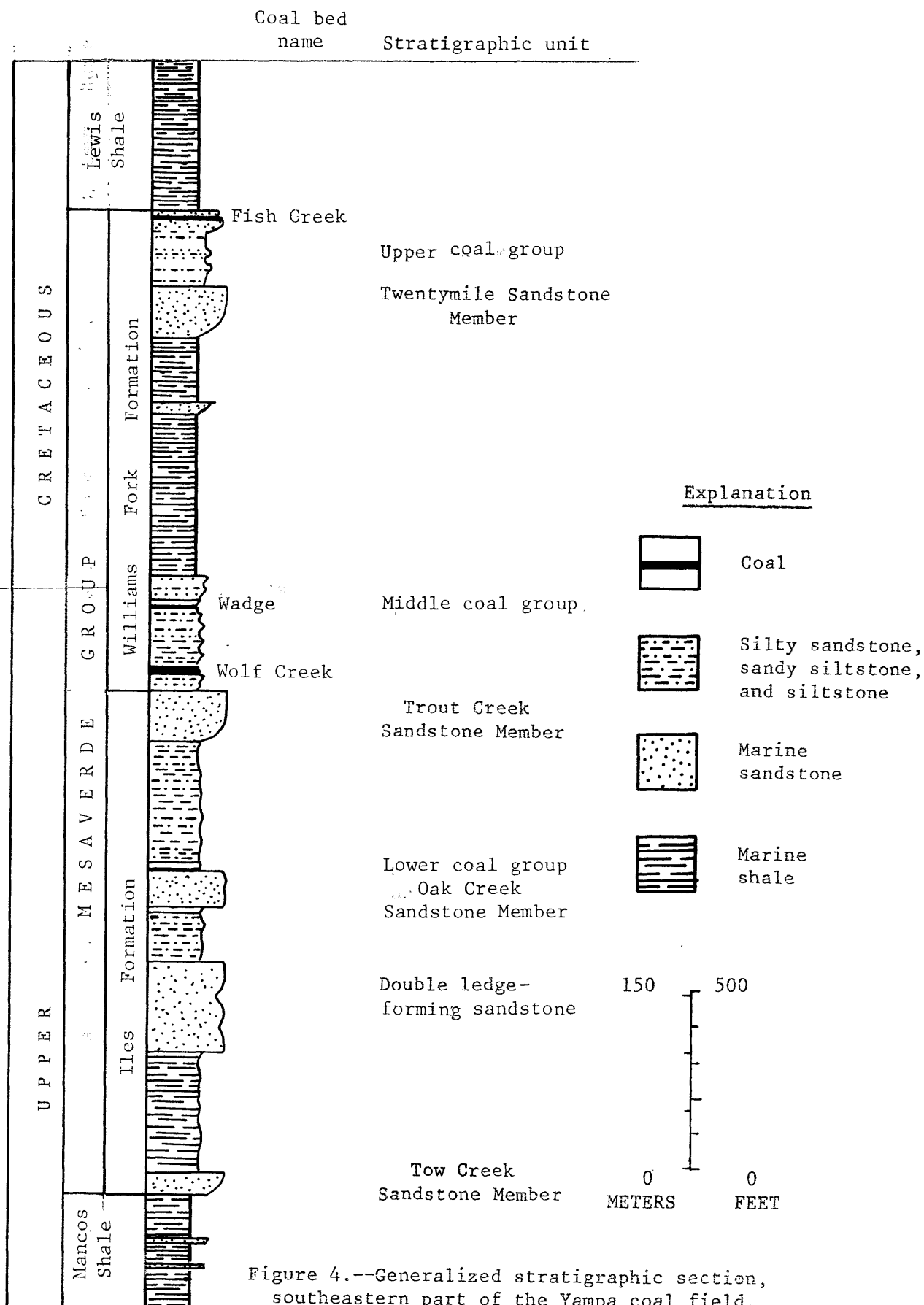


Figure 4.--Generalized stratigraphic section, southeastern part of the Yampa coal field, northwestern Colorado. (Modified from Ryer, 1977.)

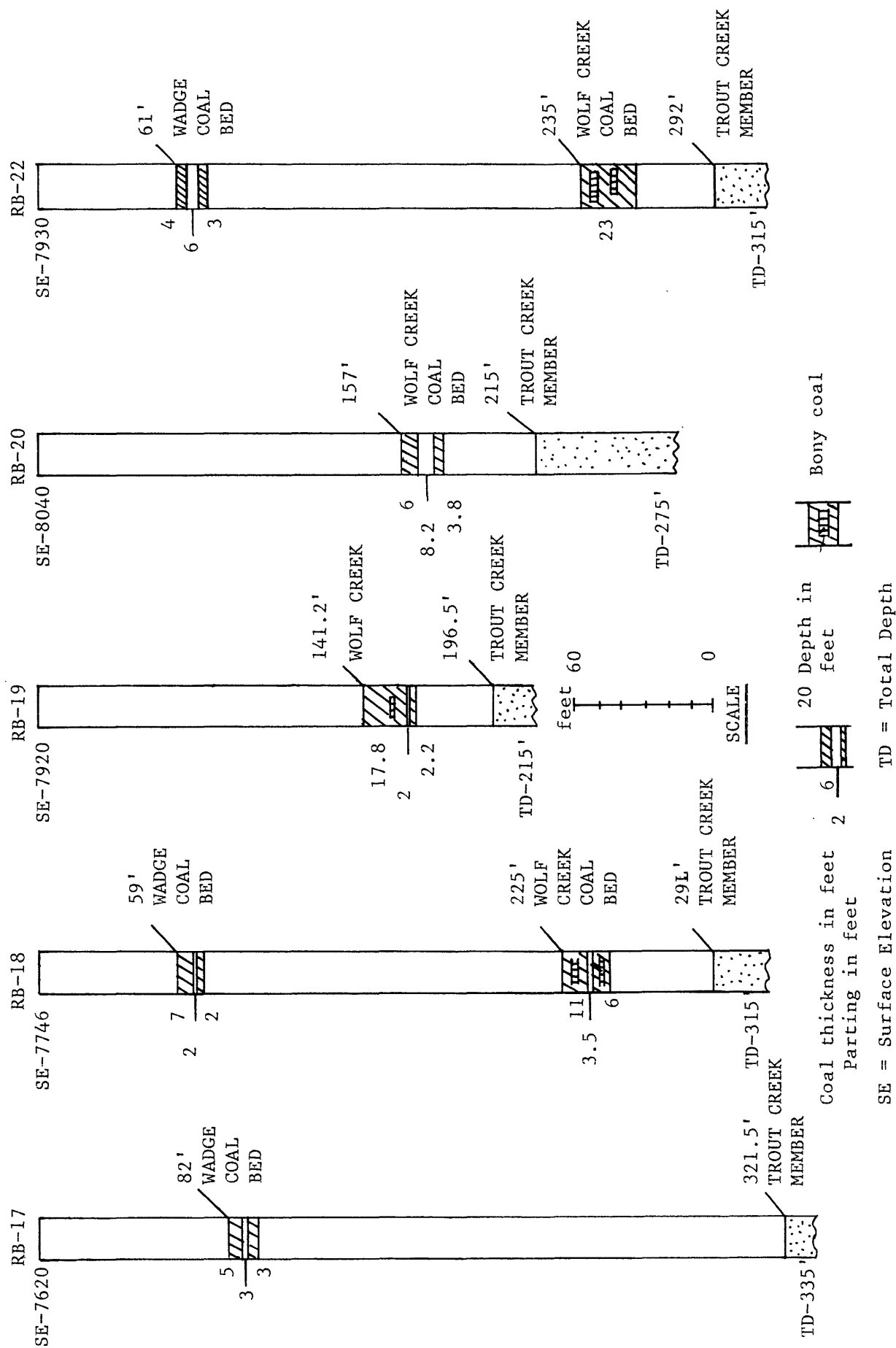


Figure 5.--Coal sections from holes drilled in the middle coal group of the Williams Fork Formation, Rattlesnake Butte quadrangle, Routt County, Colorado.

Table 1.--Drill-hole locations, elevations, and
drilling and logging depths

[All depths stated herein are in feet; to convert to meters, multiply
by 0.3048]

Hole No.	Location	Surface elevation	Total depth drilled	Depth logged
RB-17	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 9 T. 4 N., R. 86 W.	7,620	335	330
RB-18	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19 T. 4 N., R. 86 W.	7,746	315	310
RB-19	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19 T. 4 N., R. 86 W.	7,920	215	210
RB-20	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23 T. 4 N., R. 87 W.	8,040	255	247
RB-22	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23 T. 4 N., R. 87 W.	7,930	315	310
RB-16	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27 T. 5 N., R. 86 W.	6,835	30	28
RB-23	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28 T. 5 N., R. 86 W.	6,805	295	290
RB-24	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27 T. 5 N., R. 86 W.	6,813	20	18

Table 2.--Proximate analysis of Fish Creek coal bed core samples

[Analyses by Colorado School of Mines Research Institute, AR, as received; AD, air dried]

Sample No.	Proximate analysis (in percent)							Heating value Btu/lb	
	Moisture	Volatile matter (AR)	(AD)	Ash (AR)	(AD)	Fixed carbon (AR)	(AD)	(AR)	(AD)
RB-16	12.7	36.1	41.3	4.72	5.41	46.5	53.3	.78	.89
								11,437	13,101
RB-23	12.1	35.4	40.2	4.44	5.05	48.1	54.8	.48	.55
								11,601	13,198
RB-24	13.4	35.0	40.5	6.09	7.03	45.5	52.5	1.22	1.41
								11,149	12,874

Drill-hole RB-17

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: SW¹/₄SW¹/₄ sec. 9, T. 4 N., R. 86 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 7,620 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Colluvium, weathered siltstone and mudstone-----	0	5
Colluvium, weathered sandstone; trace carbonaceous material-----	5	20
Sandstone, pale-yellowish-orange, fine- to medium- grained, salt-and-pepper-----	20	45
Siltstone, dark; carbonaceous shale-----	45	59
Sandstone, medium-gray, silty, with streaks of carbona- ceous material-----	59	71
Bony coal-----	71	72.5
Sandstone, light-grayish-brown-----	72.5	75
Sandstone, light-gray, medium- to fine-grained, salt-and- pepper-----	75	85
Coal; some bony coal - <u>Wedge coal bed</u> -----	85	96.5
Sandstone, yellowish-orange-gray, fine-grained, salt- and pepper-----	96.5	101.5
Sandstone, light- to medium-gray, medium-grained; dark siltstone and carbonaceous shale, both increasing toward bottom-----	101.5	120
Sandstone, light-gray, fine-grained; carbonaceous shale and dark siltstone-----	120	137

Drill-hole RB-17 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, pale-yellowish-orange, medium-grained, salt-and-pepper-----	137	145
Sandstone, yellowish-orange-gray, medium-grained, salt-and-pepper; carbonaceous shale and dark siltstone-----	145	154
Coal-----	154	155
Sandstone, very pale grayish orange, medium-grained, well-sorted, salt-and-pepper-----	155	162
Sandstone, very pale grayish orange, medium-grained, well-sorted, salt-and-pepper; carbonaceous shale; trace coal-----	162	175
Siltstone, light-gray, medium-grained; streaks of shale---	175	180
Shale, reddish-brown, carbonaceous-----	180	205
Sandstone, light-gray, medium-grained, poorly sorted with streaks of carbonaceous shale, and dark siltstone-----	205	207
Shale, carbonaceous-----	207	210
Sandstone, light-gray, medium-grained, poorly sorted; streaks of carbonaceous shale and dark siltstone-----	210	212
Coal; bony coal, and carbonaceous shale-----	212	214
Sandstone, light-medium-gray, medium-grained to silty, moderately sorted; dark siltstone and carbonaceous shale-----	214	225
Sandstone, light-gray, very fine grained; trace streaks of carbonaceous shale-----	225	235
Sandstone, light- to medium-gray, fine- to medium-grained; carbonaceous shale; bony coal; trace coal particles; dark siltstone-----	235	253

Drill-hole RB-17 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Shale, reddish-brown, carbonaceous; trace coal-----	253	260
Shale, reddish-brown, carbonaceous; trace coal; light-gray, medium-grained sandstone-----	260	265
Shale, reddish-brown, carbonaceous; trace coal-----	265	274
Coal-----	274	275
Shale, reddish-brown; dark siltstone; light-gray, medium- grained sandstone-----	275	287
Coal-----	287	288
Sandstone, light-gray, fine- to medium-grained; carbona- ceous shale streaks; dark siltstone-----	288	310
Coal-----	310	311
Sandstone, light- to medium-gray, medium-grained; car- bonaceous shale and dark siltstone-----	311	319
Shale, carbonaceous, and bony coal-----	319	319.5
Sandstone, light- to medium-gray, medium-grained; car- bonaceous shale, and dark siltstone-----	319.5	323
Sandstone, white, very fine grained, very clean, very well sorted - <u>Trout Creek Member</u> -----	323	335
Total depth - 335 ft		

Drill-hole RB-18

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, T. 4 N., R. 86 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 7,746 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, yellow and gray, fine-grained, salt-and-pepper, with black chert-----	0	20
Sandstone, yellow and gray, fine-grained; brown and gray siltstone and shale stringers-----	20	25
Sandstone, yellow and gray, fine-grained-----	25	35
Siltstone and shale, brownish-gray, medium-grained-----	35	40
Shale, dark-gray; carbonaceous shale-----	40	45
Shale, carbonaceous; coal-----	45	50
Shale, gray to dark-gray; light-gray siltstone-----	50	55
Shale, dark-grayish-brown, carbonaceous; light-gray siltstone-----	55	60
Shale, carbonaceous-----	60	63
Coal; carbonaceous shale - <u>Wedge coal bed</u> -----	63	73
Siltstone, light-gray, and dark-gray shale-----	73	80
Sandstone, very light gray to whitish-gray, very fine grained-----	80	85
Sandstone, light-gray, very fine grained, and light-brownish-gray siltstone-----	85	90
Siltstone, medium- to dark-gray; dark-gray shale-----	90	100
Sandstone, light- to medium-gray, very fine grained; dark shale and dark siltstone-----	100	115

Drill-hole RB-18 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, medium-gray, very fine grained-----	115	120
Sandstone, light-gray, very fine grained-----	120	125
Sandstone, light-gray, very fine grained; carbonaceous shale-----	125	130
Sandstone, light-gray, very fine grained; carbonaceous shale-----	130	135
Sandstone, medium-gray, very fine grained, with coal streaks; coal (10-15%)-----	135	140
Siltstone, medium-gray, with coal streaks-----	140	145
Sandstone, light- to medium-gray, very fine grained, salt-and-pepper, with coaly streaks-----	145	150
Sandstone, medium-grained, very fine grained; carbonaceous shale-----	150	155
Sandstone, light- to medium-gray, very fine grained; carbonaceous shale; light-gray sandy siltstone-----	155	165
Sandstone, medium- to dark-gray, very fine grained, silty-	165	170
Siltstone to shale, medium- to dark-gray-----	170	175
Siltstone, medium-gray-----	175	180
Siltstone, medium-gray, with dark siltstone laminations---	180	185
Mudstone, dark-grayish-brown-----	185	200
Sandstone, reddish-brown, very fine grained-----	200	205
Sandstone, light-tan, very fine grained; coal (0-5%)-----	205	210
Sandstone, medium-grayish-brown; carbonaceous shale-----	210	222

Drill-hole RB-18 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, medium-grayish-brown; carbonaceous shale-----	222	230
Coal; carbonaceous shale - <u>Wolf Creek coal bed</u> -----	230	251
Siltstone, light-brown; carbonaceous shale (20%)-----	251	255
Sandstone, light-brown, medium-grained; dark shale-----	255	270
Sandstone, light- to medium-grayish-brown, medium-grained; carbonaceous shale-----	270	275
Coal-----	275	276
Sandstone, light- to medium-grayish-brown, medium-grained; carbonaceous shale-----	276	280
Clay, white; siltstone-----	280	284
Coal-----	284	285
Clay, white-----	285	290
Sandstone, white, very fine grained, clean - <u>Trout Creek</u> <u>Member</u> -----	290	315
Total depth - 315 ft		

Drill-hole RB-19

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, T. 4 N., R. 86 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 7,920 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Colluvium, clay; burn material-----	0	15
Clay, light-gray-----	15	20
Sandstone, medium-gray, fine-grained; carbonaceous shale--	20	35
Sandstone, medium-gray, fine-grained; carbonaceous shale (more than above)-----	35	40
Sandstone, buff-white, very fine grained, very clean-----	40	45
Sandstone, medium-gray, fine-grained-----	45	50
Coal-----	50	51.5
Sandstone, pale-yellowish-orange to pale-yellowish-brown, fine-grained grading to very fine grained-----	51.5	65
Sandstone, medium-gray, medium-grained; carbonaceous shale-----	65	70
Sandstone, light-gray to medium-gray, medium-grained, with carbonaceous shale laminations-----	70	85
Shale, light- to medium-gray; light- to medium-gray siltstone-----	85	90
Sandstone, pale-yellowish-orange to pale-yellowish-brown, fine-grained; light- to medium-gray shale and also car- bonaceous shale-----	90	95

Drill-hole RB-19 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, yellowish-gray, shaly-----	95	100
Siltstone, yellowish-gray, shaly-----	100	105
Siltstone, dark-gray, shaly-----	105	115
Siltstone, medium- to dark-gray-----	115	122
Sandstone, pale-yellowish-orange, fine-grained-----	122	125
Sandstone, medium- to dark-brownish-gray, silty; pale- yellowish-orange sandstone; dark shale-----	125	130
Sandstone, medium- to dark-brownish-gray, silty; carbona- ceous shale and dark siltstone-----	130	135
Sandstone, light-gray to white, very fine grained, salt-and-pepper-----	135	140
Sandstone, medium-grayish-brown, medium-grained, carbona- ceous shale-----	140	145
Coal; bony coal - <u>Wolf Creek coal bed</u> -----	145	160
Bony coal-----	160	163
Coal-----	163	165
Sandstone, medium-grayish-brown, medium-grained; bony coal-----	165	170
Sandstone, medium-grayish-brown, medium-grained; carbona- ceous shale; bony coal-----	170	180
Bony coal, carbonaceous shale, and dark-brown siltstone; coal-----	180	185
Sandstone, light- to yellowish-orange-gray, fine- grained; carbonaceous shale-----	185	190

Drill-hole RB-19 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Clay, white; carbonaceous shale; trace coal-----	190	200
Sandstone, white, very fine grained, very clean, well-		
sorted - <u>Trout Creek Member</u> -----	200	215
Total depth - 215 ft		

Drill-hole RB-20

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T. 4 N., R. 87 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 8,040 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Colluvium, sandstone, pale-yellow-orange, medium-grained-----	0	10
Clay, light-grayish-brown to reddish-brown-----	10	20
Clay, light-grayish-brown to reddish-brown; carbonaceous shale-----	20	25
Siltstone, light- to medium-gray, grades into very fine sandstone, shaly with carbonaceous laminations-----	25	50
Sandstone, light-gray, <u>fine-grained</u> , with carbonaceous laminations; coal-----	50	55
Sandstone, light-gray, fine-grained-----	55	60
Sandstone, light- to medium-gray, medium-grained, with carbonaceous laminations; coal-----	60	65
Sandstone, light- to whitish-gray, very fine grained; pale-yellowish-orange, very fine grained sandstone-----	65	70
Sandstone, pale-yellowish-orange to brownish-gray and fine-grained-----	70	75
Sandstone, brownish-gray, fine-grained, salt-and-pepper---	75	80
Sandstone, light-gray, fine-grained, well-sorted; carbonaceous shale-----	80	90

Drill-hole RB-20 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, medium-gray, fine-grained; dark siltstone-----	90	95
Sandstone, light-gray, fine-grained; carbonaceous shale---	95	100
Siltstone and shale, dark-brown-----	100	105
Sandstone, yellowish-orange, medium-grained-----	105	110
Sandstone, light-brownish-gray, medium-grained, salt-and-pepper-----	110	115
Siltstone and shale, dark-brown and carbonaceous, with sandstone streaks-----	115	120
Sandstone, medium-brownish-gray, fine-grained; dark siltstone and carbonaceous shale-----	120	135
Sandstone, light-brownish-gray, very fine grained, grades into light-gray, very fine grained sandstone; carbonaceous shale-----	135	162
Coal; bony coal - <u>Wolf Creek coal bed</u> -----	162	171
Bony coal - <u>Wolf Creek coal bed</u> -----	171	172
Coal - <u>Wolf Creek coal bed</u> -----	172	176
Sandstone - <u>Wolf Creek coal bed</u> , split-----	176	176.5
Coal - <u>Wolf Creek coal bed</u> -----	176.5	178
Bony coal - <u>Wolf Creek coal bed</u> -----	178	178.5
Coal - <u>Wolf Creek coal bed</u> -----	178.5	180
Sandstone, light-gray, very fine grained; dark siltstone--	180	200
Sandstone, light-gray to white, very fine grained; carbonaceous shale-----	200	218
Coal; carbonaceous shale-----	218	220

Drill-hole RB-20 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, light-gray to white, very fine grained, very clean, well-sorted-----	220	227
Sandstone, white, very fine grained, very clean, very well sorted - <u>Trout Creek Member</u> -----	227	255
Total depth - 255 ft		

Drill-hole RB-22

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, T. 4 N., R. 87 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 7,390 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Colluvium; very pale grayish-orange, medium-grained, salt- and-pepper sandstone-----	0	10
Sandstone, pale-yellowish-orange, medium-grained, salt-and- pepper-----	10	45
Siltstone, medium-brown, medium-grained, with streaks of carbonaceous shale-----	45	50
Siltstone, reddish-brown, shaly-----	50	61
Coal - <u>Wedge coal bed</u> -----	61	65
Sandstone, medium-gray, medium-grained; carbonaceous shale-----	65	70
Coal; bony coal; carbonaceous shale-----	70	75
Shale, dark; coal particles-----	75	76
Sandstone, pale-yellowish-orange, fine-grained-----	76	78
Sandstone, light-gray, fine-grained-----	78	85
Sandstone, light-gray, very fine grained; carbonaceous shale-----	85	100
Sandstone, very pale grayish-orange, fine-grained, salt- and-pepper-----	100	105
Sandstone, very light gray, fine-grained, well-sorted, clean; carbonaceous shale; streaks and laminations-----	105	125

Drill-hole RB-22 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, light-gray, very fine grained, salt-and-pepper, well-sorted; streaks of carbonaceous shale-----	125	135
Shale, carbonaceous; coal-----	135	136
Sandstone, very pale orange, medium-grained, salt-and-pepper, very well sorted, clean-----	136	145
Sandstone, medium-gray, fine-grained, moderately sorted, salt-and-pepper-----	145	160
Sandstone, medium-gray, very fine grained; stringers of carbonaceous shale-----	160	185
Sandstone, pale-yellowish-orange, medium-grained, salt-and-pepper-----	185	190
Sandstone, light- to medium-gray, fine-grained-----	190	195
Sandstone, light- to medium-gray, fine-grained; carbonaceous shale and some streaks-----	195	210
Shale, carbonaceous, brownish-gray-----	210	223
Coal, <u>sample lost owing to hole dampness</u> -----	223	?
Shale, carbonaceous; coal-----	225	230
Sandstone, light-gray, medium-grained; carbonaceous shale streaks; coal-----	230	238
Coal - <u>Wolf Creek coal bed</u> -----	238	260
Shale, carbonaceous; gray siltstone-----	260	275
Clay, white-----	275	287
Sandstone, white, very fine grained, very well sorted, clean - <u>Trout Creek Member</u> -----	287	315
Total depth - 315 ft		

Drill-hole RB-16

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, T. 5 N., R. 86 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 6,835 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Colluvium; weathered shale-----	0	14
Shale, gray-----	14	20
Coal - <u>Fish Creek coal bed</u> -----	20	25
Shale, grayish-brown; brown sandstone-----	25	30
Total depth - 30 ft		

Drill-hole RB-23

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: $NE\frac{1}{4}NE\frac{1}{4}$ sec. 28, T. 5 N., R. 86 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 6,805 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Colluvium-----	0	14
Shale, gray, soft-----	14	20
Shale, carbonaceous-----	20	76
Coal - <u>Fish Creek coal bed</u> -----	76	80
Sandstone, light-brown, medium-grained-----	80	83
Sandstone, very light gray, fine- to medium-grained, salt-and-pepper, feldspar (30%), angular grains-----	83	120
Sandstone, very light gray, fine- to medium-grained, salt- and-pepper; carbonaceous dusky-brown shale-----	120	130
Sandstone, very light gray, fine- to medium-grained, salt- and-pepper; no shale-----	130	135
Sandstone, very light gray, fine- to medium-grained, salt- and-pepper; streaks of carbonaceous shale (61%)-----	135	140
Sandstone, very light gray, fine- to medium-grained, salt- and-pepper-----	140	145
Sandstone, very light gray, fine-grained, salt-and- pepper, much feldspar, more clay; carbonaceous shale----	145	155
Sandstone, very light gray to light-gray, very fine grained; streaks of carbonaceous shale, less feldspar, better cemented-----	155	160

Drill-hole RB-23 - continued

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Sandstone, very light gray to light-gray, very fine grained, with more streaks of carbonaceous shale; carbonaceous shale (30-40%)-----	160	170
Shale, carbonaceous, dusky-brown-----	170	175
Sandstone, medium-gray; carbonaceous shale and dusky-yellowish-brown siltstone-----	175	180
Sandstone to siltstone, light-gray, very fine grained to fine-grained; streaks of carbonaceous shale (<5%); medium-gray to medium-dark-gray, very fine to fine-grained sandstone to siltstone; carbonaceous shale (<5%), and dark siltstone increases <u>downward</u> (30-40%)-----	180	200
Siltstone, dark-gray to dusky-brown (50%); carbonaceous shale, (20-30%) which increases to 40% <u>downward</u> ; light-gray silty sandstone-----	200	245
Sandstone, light-gray to medium-light-gray, very fine grained, salt-and-pepper; mostly quartz, well-cemented; streaks of carbonaceous shale (minor)-----	245	250
Sandstone, light-gray, fine-grained, salt-and-pepper (10%), micaceous-----	250	255
Sandstone, very light gray, very fine grained, subrounded grains, silty at top - <u>Twentymile Member</u> -----	255	295
Total depth - 295 ft		

Drill-hole RB-24

[All depths are in feet; to convert to meters, multiply by 0.3048]

Location: NW¹/₄NW¹/₄ sec. 27, T. 5 N., R. 86 W., Rattlesnake Butte quadrangle,
Routt County, Colorado

Surface elevation: 6,813 ft

<u>Lithologic description</u>	Depth (ft)	
	<u>From</u>	<u>To</u>
Colluvium-----	0	9
Colluvium; gravel-----	9	10
Coal - <u>Fish Creek coal bed</u> -----	10	14
Sandstone, grayish-brown, medium-grained; coal streaks----	14	20
Total depth - 20 ft		